REMARKS

This paper is being provided in response to the February 14, 2003 Final Office Action for the above-referenced application. In this response, applicant has amended claims 10-14, 16-20, and 22-26 in order to clarify that which Applicant deems to be the invention. Applicant respectfully submits that the amendments to the claims are all supported by the originally filed application. These amendments are made without prejudice to Applicant's ability to pursue the original claims in this or a continuing application.

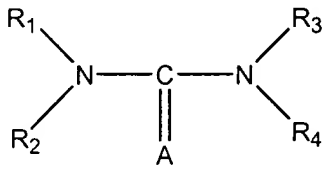
The rejection of claims 10-14 under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 5,981,454 (hereinafter referred to as "Small") in view of U.S. Patent No. 6,068,000 (hereinafter referred to as "Tanabe") is hereby traversed and reconsideration thereof is respectfully requested. Applicant respectfully submits that the claims, as amended herein, are patentable over the cited references.

As amended, claim 10 recites stripping a resist film on a semiconductor wafer having an exposed metal film, by using a stripper composition containing an anticorrosive agent which contains (a) urea or a urea derivative, (b) a hydroxy aromatic compound, (c) a hydroxylamine, (d) water and (e) a water soluble organic solvent selected from the group including sulfoxides, dimethylformamides, dimethyl acetamides, glycols, glycol ethers, pyrrolidones, imidazolidinones as essential components. Components (a) and (b) supplement each other to form a coating layer that imparts hydrophobicity to the exposed metal film.

As amended, claim 11 recites stripping a resist film on a semiconductor wafer having an exposed metal film, by using a stripper composition containing an anticorrosive agent which contains (a) urea or a urea derivative, (b) a hydroxy aromatic compound, (c) a hydroxylamine, (d) water and (e) a water soluble organic solvent selected from the group including sulfoxides, dimethylformamides, dimethyl acetamides, glycols, glycol ethers, pyrrolidones, imidazolidinones as essential components. The amounts of the components (a), (b), (c) and (d) are 1 to 60% by mass, 0.1 to 20% by mass, 5 to 70% by mass and 2 to 40% by mass,

respectively. Components (a) and (b) supplement each other to form a coating layer that imparts hydrophobicity to the exposed metal film.

As amended, claim 12 recites stripping a resist film on a semiconductor wafer having an exposed metal film, by using a stripper composition containing an anticorrosive agent which contains (a) urea or a urea derivative, (b) a hydroxy aromatic compound, and a water soluble organic solvent selected from the group including sulfoxides, dimethylformamides, dimethyl acetamides, glycols, glycol ethers, pyrrolidones, imidazolidinones, as essential components. The component (a) is a compound represented by the following general formula (1):



(1)

R1, R2, R3 and R4 are each independently a hydrogen atom or an alkyl group having 1 to 3 carbon atoms, and A is an oxygen atom or a sulfur atom. Components (a) and (b) supplement each other to form a coating layer that imparts hydrophobicity to the exposed metal film.

As amended, claim 13 recites stripping a resist film on a semiconductor wafer having an exposed metal film, by using a stripper composition containing an anticorrosive agent which contains (a) urea or a urea derivative, (b) a hydroxy aromatic compound, having a benzene derivative having at least two phenolic hydroxyl groups in the molecule, and a water soluble organic solvent selected from the group including sulfoxides, dimethylformamides, dimethyl acetamides, glycols, glycol ethers, pyrrolidones, imidazolidinones as essential components. Components (a) and (b) supplement each other to form a coating layer that imparts hydrophobicity to the exposed metal film.

As amended, claim 14 recites stripping a resist film on a semiconductor wafer having an exposed metal film, by using a stripper composition containing an anticorrosive agent which contains (a) urea or a urea derivative, (b) a hydroxy aromatic compound, and a water soluble organic solvent selected from the group including sulfoxides, dimethylformamides, dimethyl

acetamides, glycols, glycol ethers, pyrrolidones, imidazolidinones, as essential components. The component (b) is a benzene derivative having at least two phenolic hydroxyl groups in the molecule having at least one compound selected from the group consisting of pyrogallol, hydroxyhydroquinone, fluoroglucinol, gallic acid and tannic acid. Components (a) and (b) supplement each other to form a coating layer that imparts hydrophobicity to the exposed metal film.

Small discloses a composition for removal of chemical residues from metal or dielectric surfaces or for chemical mechanical polishing of a copper surface. (See Abstract; Col. 2, Lines 37-40). The residues removed are either particulates or post etch residue such as chemicals that may cause corrosion if not removed. The solution used is aqueous with an acidic nature with various salts, acids and amines added to make the solution into an oxidizing material. (Col. 3, Line 40-Col. 4, Line 25).

Tanabe discloses a substrate treatment method performed after forming the resist pattern on a substrate and etching the resist. (See Abstract; Col. 1, Lines 5-15). Tanabe discloses using a rinsing solution of water and a water-soluble organic solvent after a removing treatment using a hydrofluoric acid-based remover solution. (Col. 2, Lines 36-44; Col. 3, Lines 3-8). Tanabe discloses that an additional anticorrosive may be included in the lithographic rinsing solution. (Col. 6, Lines 10-18).

Applicant respectfully submits that independent claims 10-14, as amended herein, are not obvious over Small in view of Tanabe. Each of these claims has been amended to specify that the urea (component (a)) and the hydroxyaromatic compound (component (b)) supplement each other to form a coating layer that imparts hydrophobicity to the exposed metal film. Support for this amendment is found, for example, at page 8, lines 10-14 of the specification.

Small suggests that urea compounds may be *substituted* for hydroxyaromatic compounds when used as oxidizers, but fails to suggest the *mixture* of urea and hydroxyaromatic compounds. As discussed in the specification, Applicant has found that by mixing these two components, unexpectedly good anticorrosive properties can be obtained, because the two components

together form a protective coating layer (page 8, line 14). The use of these components as *anticorrosives* is contrary to the teachings of Small, which specifically describes them as *oxidizers* (col. 7, line 39). Since the corrosion to be prevented is generally oxidation of the metal film, one of ordinary skill in the art would not look to a component described as an oxidizer to improve anticorrosion properties. *See* MPEP 2143.01, citing In re Ratti, 270 F.2d 810, 123 USPQ 349 (CCPA 1959) ("If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims prima facie obvious").

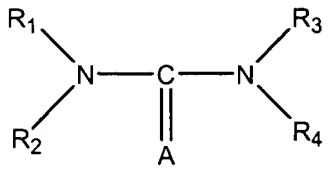
The deficiencies of Small are not remedied by Tanabe. The latter reference is relied upon solely to teach the use of a water-soluble organic solvent. Since Tanabe does not teach or suggest the use of urea or hydroxyaromatic compounds at all, it does not teach or suggest that these compounds be mixed to improve anticorrosive properties. Thus, Small and Tanabe do not render the claimed invention obvious, whether taken separately or in combination.

The rejection of claims 16-20, 22-26, 28, and 29 under 35 U.S.C. §103(a) as being obvious over Small and Tanabe in view of U.S. Patent No. 6,204,192 (hereinafter referred to as "Zhao") is hereby traversed and reconsideration thereof is respectfully requested. Applicant respectfully submits that the claims, as amended herein, are patentable over the cited references.

As amended, claim 16 recites forming on a semiconductor wafer, a metal film and an insulating film in this order, forming a resist film thereon, and conducting dry etching with the resist film being used as a mask, to form, in the insulating film, dents reaching the metal film. The resist film and/or the residue of etching are then stripped by using a stripper composition containing an anticorrosive agent which contains (a) urea or a urea derivative, (b) a hydroxy aromatic compound, (c) a hydroxylamine or an alkanolamine, (d) water, and (e) a water soluble organic solvent selected from the group including sulfoxides, dimethylformamides, dimethyl acetamides, glycols, glycol ethers, pyrrolidones, imidazolidinones, as essential components. Components (a) and (b) supplement each other to form a coating layer that imparts hydrophobicity to the metal film.

As amended, claim 17 recites forming, on a semiconductor wafer, a metal film and an insulating film in this order, forming a resist film thereon, and conducting dry etching with the resist film being used as a mask, to form, in the insulating film, dents reaching the metal film. The resist film and/or the residue of etching are then stripped by using a stripper composition containing an anticorrosive agent which contains (a) urea or a urea derivative, (b) a hydroxy aromatic compound, (c) a hydroxylamine or an alkanolamine, (d) water, and (e) a water soluble organic solvent selected from the group including sulfoxides, dimethylformamides, dimethyl acetamides, glycols, glycol ethers, pyrrolidones, imidazolidinones, as essential components. The amounts of the components (a), (b), (c) and (d) are 1 to 60% by mass, 0.1 to 20% by mass, 5 to 70% by mass and 2 to 40% by mass, respectively. Components (a) and (b) supplement each other to form a coating layer that imparts hydrophobicity to the metal film.

As amended, claim 18 recites forming, on a semiconductor wafer, a metal film and an insulating film in this order, forming a resist film thereon, and conducting dry etching with the resist film being used as a mask, to form, in the insulating film, dents reaching the metal film. The resist film and/or the residue of etching are then stripped by using a stripper composition containing an anticorrosive agent which contains (a) urea or a urea derivative, (b) a hydroxy aromatic compound, and a water soluble organic solvent selected from the group including sulfoxides, dimethylformamides, dimethyl acetamides, glycols, glycol ethers, pyrrolidones, imidazolidinones as essential components. The component (a) is a compound represented by the following general formula (1):



(1)

(R1, R2, R3 and R4 are each independently a hydrogen atom or an alkyl group having 1 to 3 carbon atoms; and A is an oxygen atom or a sulfur atom). Components (a) and (b) supplement each other to form a coating layer that imparts hydrophobicity to the metal film.

As amended, claim 19 recites forming, on a semiconductor wafer, a metal film and an insulating film in this order, forming a resist film thereon, and conducting dry etching with the resist film being used as a mask, to form, in the insulating film, dents reaching the metal film. The resist film and/or the residue of etching are then stripped by using a stripper composition containing an anticorrosive agent which contains (a) urea or a urea derivative and (b) a hydroxy aromatic compound, having a benzene derivative having at least two phenolic hydroxyl groups in the molecule, and a water soluble organic solvent selected from the group including sulfoxides, dimethylformamides, dimethyl acetamides, glycols, glycol ethers, pyrrolidones, imidazolidinones, as essential components. Components (a) and (b) supplement each other to form a coating layer that imparts hydrophobicity to the metal film.

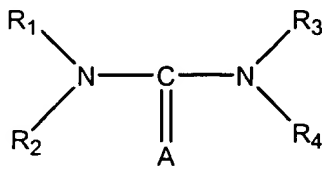
As amended, claim 20 recites forming, on a semiconductor wafer, a metal film and an insulating film in this order, forming a resist film thereon, and conducting dry etching with the resist film being used as a mask, to form, in the insulating film, dents reaching the metal film. The resist film and/or the residue of etching are then stripped by using a stripper composition containing an anticorrosive agent which contains (a) urea or a urea derivative, (b) a hydroxy aromatic compound, and a water soluble organic solvent selected from the group including sulfoxides, dimethylformamides, dimethyl acetamides, glycols, glycol ethers, pyrrolidones, imidazolidinones, as essential components. The component (b) is a benzene derivative having at least two phenolic hydroxyl groups in the molecule having at least one compound selected from the group consisting of pyrogallol, hydroxyhydroquinone, fluoroglucinol, gallic acid and tannic acid. Components (a) and (b) supplement each other to form a coating layer that imparts hydrophobicity to the metal film.

As amended, claim 22 recites forming, on a semiconductor wafer, a metal film, a first insulating film and a second insulating film having desired openings, and conducting dry etching with the second insulating film being used as a mask, to form, in the first insulating film, dents reaching the metal film. The residue of etching is then stripped by using a stripper composition containing an anticorrosive agent which contains (a) urea or a urea derivative, (b) a hydroxy aromatic compound, (c) a hydroxylamine or an alkanolamine, (d) water and (e) a water soluble

organic solvent selected from the group including sulfoxides, dimethylformamides, dimethyl acetamides, glycols, glycol ethers, pyrrolidones, imidazolidinones as essential components, wherein components (a) and (b) supplement each other to form a coating layer that imparts hydrophobicity to the metal film.

As amended, claim 23 recites forming, on a semiconductor wafer, a metal film, a first insulating film and a second insulating film having desired openings, and conducting dry etching with the second insulating film being used as a mask, to form, in the first insulating film, dents reaching the metal film. The residue of etching is then stripped by using a stripper composition containing an anticorrosive agent which contains (a) urea or a urea derivative, (b) a hydroxy aromatic compound, (c) a hydroxylamine or an alkanolamine, (d) water and (e) a water soluble organic solvent selected from the group including sulfoxides, dimethylformamides, dimethyl acetamides, glycols, glycol ethers, pyrrolidones, imidazolidinones as essential components. The amounts of the components (a), (b), (c) and (d) are 1 to 60% by mass, 0.1 to 20% by mass, 5 to 70% by mass and 2 to 40% by mass, respectively. Components (a) and (b) supplement each other to form a coating layer that imparts hydrophobicity to the metal film.

As amended, claim 24 recites forming, on a semiconductor wafer, a metal film, a first insulating film and a second insulating film having desired openings, and conducting dry etching with the second insulating film being used as a mask, to form, in the first insulating film, dents reaching the metal film. The residue of etching is then stripped by using a stripper composition containing an anticorrosive agent which contains (a) urea or a urea derivative, (b) a hydroxy aromatic compound, and a water soluble organic solvent selected from the group including sulfoxides, dimethylformamides, dimethyl acetamides, glycols, glycol ethers, pyrrolidones, imidazolidinones, as essential components. The component (a) is a compound represented by the following general formula (1):



(1)

(R1, R2, R3 and R4 are each independently a hydrogen atom or an alkyl group having 1 to 3 carbon atoms; and A is an oxygen atom or a sulfur atom). Components (a) and (b) supplement each other to form a coating layer that imparts hydrophobicity to the metal film.

As amended, claim 25 recites forming, on a semiconductor wafer, a metal film, a first insulating film and a second insulating film having desired openings, and conducting dry etching with the second insulating film being used as a mask, to form, in the first insulating film, dents reaching the metal film. The residue of etching is then stripped by using a stripper composition containing an anticorrosive agent which contains (a) urea or a urea derivative and (b) a hydroxy aromatic compound, having a benzene derivative having at least two phenolic hydroxyl groups in the molecule, and a water soluble organic solvent selected from the group including sulfoxides, dimethylformamides, dimethyl acetamides, glycols, glycol ethers, pyrrolidones, imidazolidinones, as essential components. Components (a) and (b) supplement each other to form a coating layer that imparts hydrophobicity to the metal film.

As amended, claim 26 recites forming, on a semiconductor wafer, a metal film, a first insulating film and a second insulating film having desired openings, andconducting dry etching with the second insulating film being used as a mask, to form, in the first insulating film, dents reaching the metal film. The residue of etching is then stripped by using a stripper composition containing an anticorrosive agent which contains (a) urea or a urea derivative, (b) a hydroxy aromatic compound, and a water soluble organic solvent selected from the group including sulfoxides, dimethylformamides, dimethyl acetamides, glycols, glycol ethers, pyrrolidones, imidazolidinones as essential components. The component (b) is a benzene derivative having at least two phenolic hydroxyl groups in the molecule having at least one compound selected from the group consisting of pyrogallol, hydroxyhydroquinone, fluoroglucinol, gallic acid and tannic acid. Components (a) and (b) supplement each other to form a coating layer that imparts hydrophobicity to the metal film.

Claims 28 and 29 depend from claims 10 and 11, respectively, and recite the additional limitation that the metal film is a copper film.

Small and Tanabe are discussed above. Zhao is relied upon to show that the steps of patterning the dielectric layer to expose the metal layer included in the steps of forming a metal film, first dielectric film and resist or second dielectric film, and etching the first dielectric layer using the resist film as a mask to expose the metal layer are known in the art.

Claims 16-20, 22-26, 28 and 29 all include the recitation that components (a) and (b) supplement each other to form a coating layer that imparts hydrophobicity to the metal film. Thus, Small and Tanabe do not render these claims obvious for the reasons discussed above in connection with similar language in claims 10-14, namely, that the references do not suggest, singly or in combination, than urea and hydroxyaromatic compounds may be combined to form a protective coating layer on the metal film.

The deficiencies of Small and Tanabe are not removed by Zhao. Zhao is cited only for the process of patterning a dielectric layer to expose a metal film, and contains no disclosure or suggestion that urea and hydroxyaromatic compounds may be beneficially combined to yield superior anticorrosive properties. Thus, Small, Tanabe, and Zhao do not render the claimed invention obvious, whether taken separately or in combination.

The rejection of claims 10-14 under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 5,885,362 (hereinafter referred to as "Morinaga") in view of Tanabe is hereby traversed and reconsideration thereof is respectfully requested. Applicant respectfully submits that the claims, as amended herein, are patentable over the cited references.

Claims 10-14 and the Tanabe reference are discussed above. Morinaga describes a method for cleaning substrates using various hydroxys, urea and water. The cleaning composition of Morinaga comprises these complexing agents as inhibitors of metal deposition. The complexing agents inhibit the deposition of metal impurities from the cleaning solution onto the wafer surface ("reverse contamination") (col. 2, lines 5-7; col. 3, lines 5-11). The reference discloses materials to remove etching residues and contamination such as particles, and does not suggest stripping resists or other organic layers with exposed metal.

As discussed above, claims 10-14 all specify that components (a) and (b) supplement each other to form a coating layer that imparts hydrophobicity to the metal film. Morinaga fails to teach such an effect. Since the purpose of the complexing agents of Morinaga is to remain in solution, preventing metal atoms from being deposited on the surface, they are present only in small enough quantities to avoid deposition on the surface. In contrast, components (a) and (b) according to the invention are present in sufficient amounts to form a coating layer on the surface that imparts hydrophobicity. Increasing the amounts of the complexing agents of Morinaga to concentrations that formed a surface coating would defeat the purpose of that reference; thus, it cannot be considered obvious to adjust the quantities of the complexing agents to obtain the recited invention. *See* MPEP 2143.01, citing In re Gordon, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984) ("If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification").

These deficiencies of Morinaga are not remedied by Tanabe. Tanabe is relied upon solely to teach the addition of a water-soluble organic solvent. It makes no suggestion that a protective film should be formed on the surface, nor does it provide any other motivation to adjust the Morinaga reference to obtain the claimed invention. Thus, Morinaga and Tanabe do not render the claimed invention obvious, whether taken separately or in combination.

The rejection of claims 16-20, 22-26, 28, and 29 under 35 U.S.C. §103(a) as being obvious over Morinaga in view of Tanabe and Zhao is hereby traversed and reconsideration thereof is respectfully requested. Applicant respectfully submits that the claims, as amended herein, are patentable over the cited references.

The claims and cited references are all discussed above. As discussed above in connection with claims 10-14, Morinaga and Tanabe contain no suggestion or teaching that urea and hydroxyaromatic compounds should be combined in order to form a protective film on the metal surface, as recited in each of the rejected claims. This deficiency is not remedied by Zhao, which is relied upon solely to teach the process of patterning a dielectric layer to expose a metal film, and contains no disclosure or suggestion that urea and hydroxyaromatic compounds may be

beneficially combined to yield superior anticorrosive properties. Thus, Morinaga, Tanabe, and Zhao do not render the claimed invention obvious, whether taken separately or in combination.

Based on the above, applicant respectfully requests that the Examiner reconsider and withdraw all outstanding rejections and objections. Favorable consideration and allowance are earnestly solicited. Should there be any questions after reviewing this paper, the Examiner is invited to contact the undersigned at 617-248-4038.

Respectfully submitted,
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